

Remarks / Arguments

Prior Art Cited by the Examiner

In the Office Action, the Examiner made reference to 1 document:

Document	Date	Inventor
US-6,188,066	August 1999	Whitehouse et al.

Claim Rejections – 35 USC § 103

The Examiner objected to claim 1 as previously amended as obvious in view of Whitehouse.

The present invention relates to distinguishing ions of the same m/z ratio but having different charge states by providing an effective barrier to block ions of one charge state while allowing ions of another charge state to be detected. A stream of ions with the same m/z can be substantially thermalized so that the ions have substantially the same kinetic energy. The inventors of the present invention have found that ions of different charges can be separated by providing an effective energy barrier that is a function of the charge state and the present invention takes advantage of this.

Whitehouse discloses a method of identifying the energy spread of ions, specifically for a group of doubly charged Gramicidin S ($M+2h$)⁺² ions (col. 13, lines 40-41), by ramping the voltage of lens 53 (Figure 2) while monitoring the mass spectrometer ion signal. In this method, Whitehouse selects the mean ion energy of the ions by adjusting the DC offset potential of the ion guide. Whitehouse subsequently ramps the voltage of lens 53 to determine the proportion of ions that fall within the selected energy (col. 13, line 61 – col. 14, line 2). From these measurements, Whitehouse concludes that mean ion energy of the ions is higher than the DC offset potential due to ion acceleration and some other unknown (col. 14, lines 7-15). However, Whitehouse is only concerned with the energy spread of ions of a specific charge state. Whitehouse's method is only accurate and effective if the trapped ions have the same charge state.

Whitehouse not only fails to recognize the effect of differently charged ions as he ramps the voltage on lens 53, he explicitly acknowledges his lack of understanding on this point. Whitehouse attributes the higher mean ion energy to the ion acceleration driven by the expanding gas in the free jet and further states that "It is not yet certain where the one to two volts of energy over 3 volts is added as the multipole ion guide DC offset potential is raised"(col. 14, lines 10-15).

There is no indication or suggestion that the higher energy is due to the effective energy barrier experienced by groups of ions having other than the doubly charge state. Whitehouse specifically fails to understand this point, and his apparatus and method are effective only when applied to ions have the same charge state. Thus, it would not be obvious to a person skilled in the art, in view of Whitehouse, to identify a method to separate ions of different charges by providing an effective energy barrier that is a function of the charge state.

In summary, the present invention allows ions having substantially the same kinetic energy but different charge states to be separated. In contrast, Whitehouse's method and apparatus are useful only for distinguishing between ions having different energies and Whitehouse does not recognize the effect of ions having different charge states.

The Applicant respectfully submits that the method and apparatus described by Whitehouse cannot be used to achieve the benefits of the present invention.

Conclusion

In view of the foregoing comments, it is respectfully submitted that the application is now in condition for allowance. If the Examiner has any further concerns regarding the language of the claims or the applicability of the prior art, the Examiner is respectfully requested to contact the undersigned at 416-957-1630.

Respectfully submitted,



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